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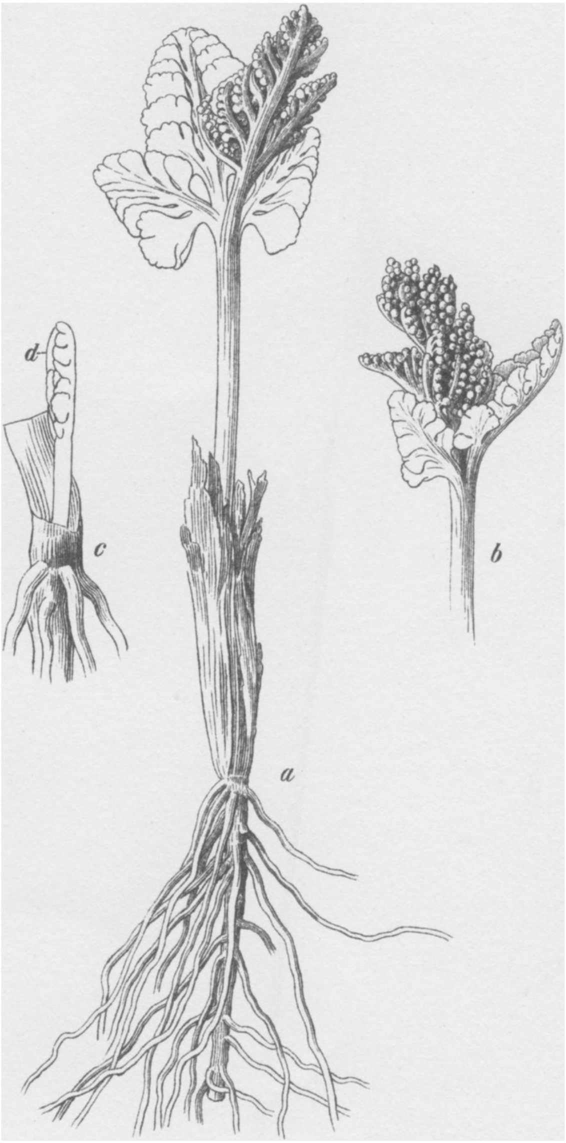

BOTRYCHIUM PUMICOLA

The Home of Botrychium pumicola

By Frederick V. Coville

(With Plate 7)

In the summer of 1897 the writer, with Mr. E. I. Applegate, acting as assistant, and a camp hand, was engaged in an investigation of the flora of the Cascade Mountains of Oregon. On August fifth in a brief trip to the summit of Llao Rock, 8148 feet altitude, one of the highest elevations in the rim of Crater Lake, a *Botrychium* was discovered, growing in considerable abundance at a single point in the dry pumice gravel with which the broad summit is covered. The spot was on the rounded crest of the rock about fifty yards west of its highest point. As the species was believed to be undescribed an ample supply of specimens was collected, and from this the following description was drawn.*

Botrychium pumicola Coville †

Rootstock vertical, reaching a length of 8 cm. and a diameter of 3 mm., with an abundance of roots a millimeter or less in diameter; stem, together with the segments of the frond, reaching a height of 10 cm., the former about twice the height of the latter and in ordinary specimens 2 to 3 or even 3.5 mm. in diameter, the lower half or two-thirds thickly sheathed with the dark brown remnants of the stems of previous years; frond glaucous, the sterile segment nearly sessile, reaching a length of 3 cm., ternate, the divisions nearly sessile, the lateral ones about half or two-thirds the length of the middle one, each pinnately parted into fan-shaped somewhat one-sided lobes, these with crenulate margins and usually two or three lobules, the lowermost lobes of the middle division sometimes distinctly pinnatifid into several lobules; fertile segment in most specimens a little longer than the sterile, bipinnate, or one or both the lowest branches sometimes so developed as to indicate a tendency to ternate division; bud with sterile segment erect, the axes of the lobes horizontal.

This *Botrychium*, although not very closely related to any species heretofore described, may best be compared with *lunaria* and

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* Published in Underwood, Our Native Ferns, ed. 6, 69. 1900.

† On the ground of euphony the combination of letters *icic*, which in strict etymological practice would occur in this word, was reduced to *ic*.

boreale. In general makeup and particularly in the form of the lobes of the frond it resembles *lunaria,* indeed it bears a striking resemblance to such an aberrant ternately divided specimen of *lunaria* as is figured by Milde in his Gefass-Cryptogamen.* In the series of thirty-one specimens of our plant preserved in the National Herbarium, however, the ternate character of the sterile segment is constant, except in a few depauperate plants in which the segment is only a few millimeters in length. In *pumicola* the three divisions of the sterile segment are ovate-triangular in outline and the lobes uniformly imbricated, the lower and larger lobes are frequently lobulate, or sometimes even pinnatifid and the entire sterile segment is congested to a maximum length of 3 cm. In *lunaria* the sterile segment has a single division, triangular-lanceolate in outline, its lobes little or not at all imbricated and seldom distinctly lobulate, the whole sterile segment often reaching a length of 5 or even 10 cm. In general configuration *pumicola* closely resembles *boreale,* a resemblance chiefly due to the deltoid-ovate outline of the sterile segment of *boreale,* but the latter has rhomboidal instead of lunate lobes, and although these show a tendency to lobulation, they have not developed to such a conspicuously greater extent than those immediately above to give the frond a really ternate character. From both *boreale* and *lunaria* the present species differs in its very pale green glaucous color, the much more persistent stem-sheaths, and the fact that the stems are buried in the soil up to the point of separation of the two segments. All of these are xerophilous characters correlated with the remarkable habitat of the plant.

The soil of Llao Rock, a fine pumice gravel, apparently without any admixture of humus, is covered in winter by probably ten feet of snow. After this melts away in spring, the soil becomes very dry, and as July and August are almost rainless the plants of this and similar areas are subjected to an annual drouth of several weeks' duration. While the elevation of this spot is very near timber line, where the flora would normally be made up of circumpolar plants, not a single such plant is found there. The species found on the area are follows :

Sitanion elymoides Raf.

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* Milde, Nov. Act. Acad. Leop. Car. **26**^{2} : *pl. 47. f. 125.* 1858.

Trisetum subspicatum (L.) Beauv.*
Carex Breweri Boott.
Eriogonum ovalifolium Nutt.
Eriogonum pyrolaefolium Hook.
Eriogonum umbellatum Torr. and another undetermined species.
Polygonum Newberryi Small.
Lupinus minimus Dougl.
Phlox diffusa Benth.
Phacelia Magellanica (Lam.) Coville.†
Orthocarpus pilosus Wats.
Pentstemon Davidsonii Greene.
Aster Shastensis Gray.
Hulsea nana Gray.
Raillardella argentea Gray.
Hieracium gracile Hook.

In all these plants there are conspicuous protective modifications which enable the species to endure the summer drouth to which they are subjected. To ordinary circumpolar plants, accustomed to the more humid conditions of moisture-holding soils, such a drouth would be fatal. The absence of such plants on the deeply cinder-covered summit of Llao Rock may therefore be easily understood. In general the plants of the area are either, like the *Botrychium*, forms which have been derived from circumpolar generic types and which have developed drouth-resistant characters adequate to their survival, or like the species of *Eriogonum*, they belong to genera confined to the American continent and growing characteristically at moderate elevations in the arid region, but differ in such a way from these low-elevation species as to be able to withstand the severe cold of a subalpine situation.

Explanation of Plate 7

Fig. *a*, entire plant; fig. *b*, lateral view of frond; fig. *c*, base of stem, the sheath dissected away so as to show the enclosed bud. Figures *a* and *b* are natural size, fig. *c* twice the natural diameter.

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* Typical *Trisetum subsp catum* is a circumpolar grass but our plant does not belong to the typical form of the species. It is likely to prove an undescribed species or subspecies.

† *Phacelia Magellanica* is a composite species and a critical study of it will doubtless show that the form to which the Llao Rock plant belongs is not identical with the typical form.